Integrated Waste Management: What It Takes

What does integrated waste management look like? We consider some case studies.

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Comments

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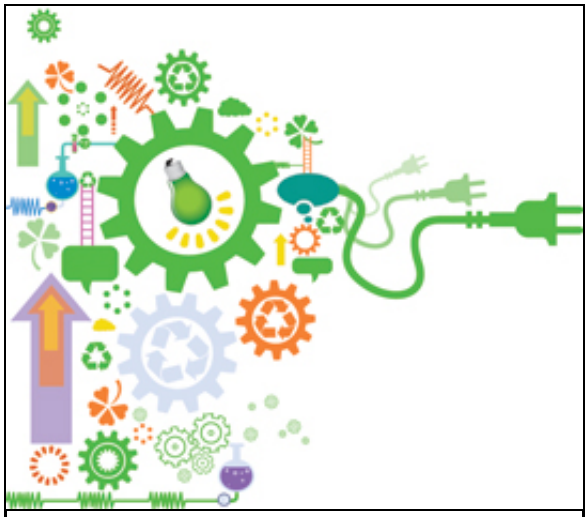
"Renewable Portfolio Standard credit is big money, but what's surprising is a lot of these companies are banking on it to help them put their business plans together." —Caroll Mortensen, Director, California Department of Resources Recycling and Recovery

"It's going to take some incentives. The subsidies have to come from somewhere." —Charley Tripp, Bureau Manager, Southeast Resource Recovery Facility, Long Beach, CA

What does it look like when a community commits to an integrated waste management strategy? What considerations influence solid waste managers to evaluate conversion technology as an alternative to landfilling or to supplement their recycling programs? What are the factors that can constrict or derail decision-making?

We talked to a cross-section of municipalities around the US considering or already in operation with an integrated approach and to their technology partners. The consensus seems to be that at this stage, two things are critical: incentives and a supportive regulatory environment.

In the North...
"As a developer of conversation technology, you have to ask yourself three questions," says John Howard III, chief technical officer of Coronal LLC in St. Paul, MN, a provider of plasma conversion technology. "Is there enough money to develop the project; is there a champion in the community who will help address the issues, and will you have access to enough feedstock? "International Falls, in Koochiching County, MN, is a perfect storm of both developer and community concerns.



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“As a state, Minnesota is very supportive of environmental protection and has a rich waste-to-energy infrastructure. The community is located adjacent to Voyagers National Park, which means fishing, water quality, and a variety of other environmental concerns. Waste from the agro-forestry industry can help supplement the MSW the community will supply, which isn’t enough to fuel a 200-ton-a-day facility, and there’s also a major railway line that passes through the area on its way to the Gulf of Mexico, which means adding railroad ties to the feedstock.”

“From the county’s perspective it was both a cost and environmental issue,” says Paul Nevanen, director of the Koochiching Economic Development Authority. Our landfill was closed back in the 1990s, and we’ve been trucking our waste over 170 miles almost into North Dakota at a million dollars annually. We’re right next to the national park, so we’re very sensitive to environmental concerns, and we have very forward-thinking county commissioners who realized we can’t continue to put our waste in the ground. One of the things that’s attractive about these conversion technologies is the different types of revenues that are available if you do it right, not only the energy output but the tipping fees.

“In Minnesota, the energy derived from MSW is classified as renewable. We’ve peaked in terms of recycling, and the Minnesota Pollution Control Agency is looking for waste-to-energy solutions as part of their mix going forward, so they’ve been very good about supporting the conversion technologies that make the most sense. The state gave us funding for a feasibility study which concluded that this kind of project would work but we needed a lot more design work. So we went back and they gave us $2.5 million, which was matched by the USDOE. Ideally, we’ll site the facility next to the paper mill here in town. Initially, the plan was to supply them with syngas as a natural gas replacement, but given the declining price of natural gas and the cost of production, we’re now looking to supply them with steam. Right now we’re starting down the permitting path. With the vigorous permitting the paper mill has to go through, the state is a little sensitive about how we’re going to integrate. Do you call it single source permitting or will the facility have its own permits?”

Down South...
Diminishing landfill space and a statewide interest in recycling and reuse were the impetus for the Enerkem plasma conversion plant now in development for Pontotoc, MS. According to Ronnie Bell at the Three Rivers Solid Waste Authority, Enerkem’s Mississippi partner, only two communities in the county offer curbside recycling, and residents have to pay for the privilege. Which is what made the county stand up and take notice when Enerkem approached them four years ago with the plan to use MSW as a feedstock. The facility will be located on the landfill site and the county is committed to supplying 189,000 tons of unsorted MSW a year.

“This is an opportunity for the 250,000 to 300,000 people we serve to tap into a materials recovery facility,” says Bell. The plant will produce 10 million gallons of ethanol a year using the same gasification and catalytic conversion module Enerkem is using in two facilities already in operation in Canada.

Under an agreement with the City of Edmonton, Alberta, the company had built and, as of June 2012, is operating a demonstration-scale facility to produce and sell next generation biofules converted from the 100,000 dry metric tons of sorted MSW the city is contracted to supply annually. Edmonton’s goal is a 90% diversion rate, and the city sees conversion technology as a link in its integrated waste management chain. The project was permitted under Alberta’s Environmental Protection and Enhancement Act and is located at the Edmonton Waste Management Centre. The city, along with Enerkem partner Alberta Innovates—Energy and Environmental Solutions, contributed $20 million to the project, which also received $3.5 million in funding as part of the province’s Biorefining Commercialization and Market Development Program. Waste Management and EB Investments added $15 million for a minority equity interest.

According to Marie-Helene Labrie, Enerkem vice president of government affairs and communications, one impetus for producing ethanol in the US is the federal Renewable Fuel Standard, RFS2, which requires 6 billion gallons of renewable fuel to be blended in the national transportation fuel supply by 2022. Mississippi was chosen for its proximity to Gulf of Mexico refineries and petrochemical manufacturers as well as the availability of affordable woody biomass that will supplement the MSW feedstock. The Pontotoc project got under way with a $50 million grant from the US DOE and an $80 million loan guarantee from the USDA. A third Enerkem project in Varennes, Quebec, will use sorted industrial commercial and institutional waste. The plant will be operated as a joint venture with GreenField Ethanol Inc. and is expected to benefit from an infusion of $27 million from the Quebec Ministry of Natural Resources and Wildlife and Investment.

Once again in Mississippi, by the time you read this, KiOR's first commercial-scale facility should be processing 500 bone-dry tons of sustainable harvested woody biomass a day, headed toward its goal of over 11 million gallons of gasoline, diesel, and fuel oil blend stocks annually. The company has fuel offtake agreements in place with Hunt Refining, Catchlight Energy (a joint venture between Chevron and Weyerhauser), and FedEx. A second facility in Natchez will process 1,500 tons of feedstock a day. In all, five facilities are planned. No federal funds were invested, but the state legislature offered a package of incentives under former Gov. Haley Barbour that included a $75 million interest-free loan.

The company calls its technology "biomass fluid catalytic cracking" (BFCC) a proprietary technology platform that uses standard oil-refining techniques to convert biomass into a renewable hydrocarbon equivalent of crude oil, which is then refined into gasoline and diesel and fuel oil blend stocks.

Also in the south, INEOS Bio, the bioenergy arm of the Swiss-based energy company, has partnered with New Plant Energy to build a commercial scale biochemical facility in Indian River County that uses a combination of gasification and fermentation to produce 8 million gallons a day of next-generation biotethanol and 6 MW of renewable power (enough to power 1,400 homes) from vegetative and other wastes. Florida implemented a Renewable Fuels Standard in 2010 that requires all gasoline sold or offered for sale in the state to contain 9% to 10% agriculturally derived denatured alcohol fuel by volume, and INEOS responded to a county RFP for a project that could help produce that.

The $130 million facility, which will be located in Vero Beach, is permitted under the Florida Department of Environment Protection and received a $50 million DOE Section 932 grant, a $75 million USDA Section 9003 loan guarantee, and a grant from the Florida Energy and Climate Commission. The company maintains it will be the first in the US to receive EPA registration to use nonfood vegetative waste materials to produce cellulosic alcohol. "You have to certify that the plant is capable of producing ethanol," says Vice President Dan Cummings. "And the second registration requires an independent analysis of the feedstocks to determine that they qualify as renewable biomass. We like this technology because you get a much higher efficiency rate for the amount of Btus going in and the process takes seven to 10 minutes compared with first-generation ethanol technologies that use a batch process and can take from 24 to 48 hours."

Out West...

When Bob Barrows at the Oregon Department of Environmental Quality queried other states about their conversion technology regulations, he came up largely empty. "Ohio reported it planned to allow facilities to take in certain types of waste and use it without a permit, and New York State has done some research. But although states are thinking about developing rules, they aren't there yet.

"Oregon has had a permitting system, but it was not really a perfect fit for conversion technology, so we decided to do some rule writing to develop a permitting scheme that is both a better fit and doesn't discourage it. Our goal is to keep the waste out of landfills and turn it into something useful, so we want to encourage the technology but also regulate it if it needs to be regulated." The department assembled an advisory group that hopes to go out for public comment on what it's developed by January 2013.

"The biological processes, basically anaerobic digestion, comes under our composting rules and the thermal/chemical processes under conversion technology rules, including pyrolysis, gasification, ethanol, and biodiesel production. Direct combustion of solid waste that uses heat to create electricity is not considered conversion technology. Oregon has statewide land use planning, so when it comes to developing a facility, it's a matter of the local jurisdictions confirming that the project meets the local planning scheme. Then the DEQ writes the permits for air and water quality and whatever other issues there might be. The process is a little more complicated in California and Washington, where local health departments and agencies have jurisdiction.

"We haven't had any major contentious issues. A representative for Physicians for Social Responsibility raised questions in the working group about air emissions from chlorinated plastic, and we agree. With anaerobic digesters there's the issue of specified risk material such as mad cow disease. These concerns haven't held up the process, but they have made us think more about how to implement the rules once we start doing them."

Down the Pacific coast, in a state with a reputation for environmental protection, California's Low Carbon Fuel Standard requires a 10% reduction in the carbon intensity of transportation fuel by 2020. Additional legislation

requires utilities to supply a percentage of their power from renewable sources, and AB 341 binds municipalities to a 75% recycling rate—all of which would seem to add up in favor of conversion technology. But the industry in California has been hobbled by what the Bionenergy Producers Association claims are three major stumbling blocks: 1) an emphasis on technology rather than performance-based regulation; 2) the fact that energy produced by conversion technology is not yet classified as renewable and therefore not eligible for credits under the state's Renewal Power Standard; and 3) post-recycled MSW routed to a CT facility rather than a landfill remains classified as disposal, which nixes landfill reduction credits.

Coby Skye, Los Angeles County Conversion Technology project manager, considers three factors crucial to the success of waste to clean energy projects. "Economics is probably the primary driver. Landfills are still relatively cheap, and in fact we've seen landfill rates decrease because of the glut of capacity created by the economic downturn. But regulations and permitting are also an issue. If these facilities are permitted as disposal facilities and their energy is not counted as renewable and they have to compete with natural gas power plants when natural gas is so cheap, this disincentives them as alternatives."

But Skye has a dream: "As we get these projects developed and figure out the value for renewable fuels and carbon credit, we can further reduce the price of conversion technology so that it is even less than landfill disposal. Right now we're seeing tipping fees in the order of $50 to $60 a ton, which is about where MRF and certain landfill costs are now. With the value for the renewable fuels and for carbon credits, we can reduce that further to where the conversion price is less than the landfill price."

But for Charley Tripp the future doesn't look so rosy. Tripp is bureau manager of the Southeast Resource Recovery Facility, a mass-burn facility located in Long Beach and operated in conjunction with Los Angeles County Sanitation Districts. Since the 1980s, when it was permitted, the facility has been profitable through the combination of tipping fees and sale of renewable power to the grid. "Many of the contracts offered in the 1980s, including waste-to-energy, solar, wind, even combined cogen plants, were designed to benefit the development and diversity of our power grid at a time when most of the power in this country was dependent on oil and the federal government. By the time the original contract for this facility is up, in 2018, this facility will be paid for, and we would like to continue to operate. But if MSW is not classified as a source of renewable energy, as it was when we were originally permitted, we will be operating at a loss."

"The statutes in California were built on two things," says Caroll Mortensen, director of the California Department of Resources Recycling and Recovery (CalRecycle), the state agency that replaced the state's Integrated Waste Management Board. "First is the fact that, at the time they were developed, the state was entering into a landfill crisis and didn't have enough disposal capacity, and, second, there were concerns about public health and safety and environmental issues. It was a very challenging time, and in addition to health and safety there was a lot of concern about the recycling markets that we had worked so hard to build. Since then, there have been attempts at least every year to adjust the legislation to recognize non-incineration waste management options, but each time they've been defeated.

"The practical argument is that if we build these projects we're going to need feedstock, and guaranteeing feedstock seems to be counterproductive to finding recycling markets. And then there's health and safety: MSW is definitely not homogenous, so we have to get an idea about air emissions and that kind of thing. Picking winners and losers as far as technology hasn't seemed to get us anywhere, so my plan is to back up and determine what "maximum extent feasible" means when it comes to removal of recyclables and to start from there. If we've picked it as clean as we can, and if there are options to landfill disposal, then we should be looking at that."

Which is pretty much what the board of directors of the Salinas Valley Solid Waste Authority thought when it began investigating alternatives to landfilling. Diversion Manager Susan Warner has been in charge of that effort. "Our board of directors directed the staff to research and explore non-combustion-based conversion technology," she says. "We issued a request for qualifications, and then, based on that response, a request for proposals for selected vendors. And throughout this review progress, which included visiting several facilities in Japan and the Plasco Ottawa demonstration plant, the three vendors which offered different types of gasification technology were ranked. An anaerobic digester was part of the original mix, but they chose to withdraw.

"One of the reasons we selected Plasco as the top ranked project to go forward with into an environmental review was that the technology had been precertified by the California Energy Commission and Plasco had received a letter from CalRecycle's chief council identifying that their system did indeed fit the definition of gasification as it is written

in the public resources code. But the definition as it stands now is very poorly written and subject to interpretation, and we received a subsequent letter from CalRecycle rescinding its original decision."

Mortensen explains the change in position. " The CEC [California Energy Commission] has its own precertification process relative to the Renewable Portfolio Standard. Their guidance documents pointed back to us to make a determination about whether the Plasco facility met the definition of gasification in the statute. If it met that definition, it would then be eligible for review by CEC for RPS credits. Our review determined that Plasco didn't meet the definition for gasification, which requires zero emissions. This doesn't mean that Plasco, or anyone else, can't go to the CEC and plead their case."

"We've invested just under $300 million in the last six years," says Plasco CEO Rod Bryden. "Our goal was technology to capture the three constituents of solid waste solids in the form of slag, water, and gas that could substitute for natural gas in engines, and to accomplish this without air emissions. When we started out, we decided it would be important to recover as much net energy as possible to deliver a clean way of handling waste, and we turned to plasma because it has the effect of purifying when it comes in contact with the waste. But when you included the environmental effects of producing the power it took to do this, it didn't look so clean. So the next thing we set out to accomplish was to have more power produced from the waste than the total amount of energy used to process it. Our plant in Ottawa uses just 400 kW of power to produce 1,300 kW of power for every ton of waste."

With the Plasco project effectively on hold, the Salinas Valley Solid Waste Authority is moving forward. "When our board authorized us to go through EIR review with Plasco, they also authorized an environmental review of a steam autoclave," says Warner. "We've very much interested in this—it's more akin to a holistic approach, more related to anaerobic digestion, but the end product in this case would be a cellulose feedstock that would be suitable for making corrugated cardboard. We've also just received grant funding from the USDA for putting the feedstock that's processed through the autoclave into a digester that would expedite the methane production. Our partner, Global Organic Energy, has been successful in a laboratory setting creating biomethane and bioethanol from MSW processed this way."

"All these facilities are different," says Mortensen, "in what they handle, how much they handle it, what's left afterward. So my vision is to work backwards from what's left over after recycling and then figure out what kinds of facilities can manage it and how they process it. It's hard when you're doing it in the abstract, but trying to shoehorn this into solid waste disposal or transformation doesn't really work because it doesn't take into account some of the benefits of these facilities."

Penelope B. Grenoble writes on waste operations, equipment, and technology.